REMARKS/ARGUMENTS

Reconsideration of the present application, as amended, is respectfully requested.

The November 17, 2004 Office Action and the Examiner's comments have been carefully considered. In response, claims are amended and remarks are set forth below in a sincere effort to place the present application in form for allowance. The amendments are supported by the application as originally filed. Therefore, no new matter is added.

REJECTION UNDER 35 USC 112

In the Office Action claim 2 is rejected under the second paragraph of 35 USC 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically, the Examiner states that it is not clear which limitation, n:m or ($n < m$) the Applicants intend to claim. In response, claim 2 is amended to more clearly comply with the requirements of 35 USC 112. Specifically, claim 2 is amended to recite that the magnitude of the first optical pulse signal is greater than that of the second optical pulse signal. The following comments are presented for the Examiner's understanding of the Amendment. The magnitude of the second optical pulse signal to be branched as a

reference signal needs to be greater than the minimum optical input sensibility of the receiving system, which comprises PD(2b) and the decision circuit (4). That is, when compared to the noise detection signal, since the reference signal requires less power, the magnitude of the second optical pulse signal becomes smaller than that of the first optical pulse signal. Making the magnitude of the first optical pulse signal to be branched as the noise detection signal larger than that of the second optical pulse signal leads to the improvement of the measurement resolution of the bit-error measurement performed by PD(2a), the decision circuit (6) and the detector (9).

In view of the amendment of claim 2, reconsideration and withdrawal of the rejection of claim 2 under the second paragraph of 35 USC 112 are respectfully requested.

PRIOR ART REJECTIONS

In the Office Action claims 1-3 and 5 are rejected under 35 USC 103 as being unpatentable over Applicants' Admitted Prior Art (AAPA) in view of USP 5,793,511 (Bulow). Claims 4 and 6 are rejected under 35 USC 103 as being unpatentable over Applicants' Admitted Prior Art in view of Bulow, and further in view of USP 6,240,055 (Takamine).

The present claimed invention as defined by claim 1 is directed to an optical-signal autocorrelation-bit-error detection device using an optical branch system including optical branch means, first light-to-energy conversion means, second light-to-electricity conversion means, first and second decision means and bit error detection means.

In the present claimed invention as defined by amended claim 1, the optical signal to be measured which is modulated by a pulse signal is branched by an optical branch means, maintaining its optical characteristics, whereafter first and second optical pulse signals are obtained and the optical pulse signals are converted into first and second electrical signals. By adopting such an optical branch system, the desirable benefits as described in the present application at page 15, line 20 - page 18, line 26 are achieved.

That is, when employing an autocorrelation error detection apparatus using an optical branch system, because an optical signal to be measured is previously branched, it is possible to increase the power of an optical signal input to the optical branch means to +3 dBm (the power of input light is doubled compared to the case of a conventional autocorrelation error detection apparatus using an electrical branch system) until an optical signal necessary to secure the linearity of an output of

light-to-electricity conversion means (PD) becomes 0 dBm after branching is performed by the optical branch means. Therefore, it is possible to raise the power level of a usable optical signal up to +3 dBm (2 mW) though the power level has been restricted up to 0 dBm.

According to the optical-signal autocorrelation-bit-error detection apparatus using an optical branch system, by branching an optical signal to be measured in advance and then converting the branched optical signals into electrical signals, it is possible to raise a voltage to be supplied to decision means and to prevent the S/N ratio from deteriorating compared to converting an optical signal to be measured into an electrical signal in advance and then branching the electrical signal into signals as in the prior art.

Moreover, according to an optical-signal autocorrelation-bit-error detection apparatus using an optical branch system, when the input level of the light entering the autocorrelation-bit-error detection apparatus is constant, the voltage to be supplied to the decision means also becomes constant.

Next, distortion within an electrical-branch system is described. When converting an optical signal to be measured into an electrical signal in advance and then branching the electrical signal into signals as in the prior art, distortion of a signal

occurs in an electrical-branch unit for branching the electrical signal.

However, when employing a method using an optical branch system as with the present claimed invention, distortion of the optical signal due to the optical branch portion of the optical branch system hardly occurs. This is attributed to the fact that if mismatching of resistance values for branching used for an electrical-branch unit serving as the branch portion of an electrical-branch system occurs, it causes reflection of an electrical signal to be branched and the reflection influences the rear stage as a distortion.

However, when performing branching by light, as in the optical branch system of the present invention, reflection does not occur at an optical branch portion and thereby a distortion due to the optical branch portion does not occur.

Moreover, distortion caused in an electrical-branch system becomes larger as the transmission frequency of a signal to be measured increases. However, when using an optical branch system, distortion does not influence a rear stage because the system is overwhelmingly superior to an electrical-branch system in its frequency characteristics.

Therefore, according to the present invention, a significant advantage is obtained in that it is possible to reduce the

influence of waveform distortions at a branch portion by changing an electrical-branch system of the prior art to the optical branch system of the present claimed invention.

Moreover, an optical amplifier has advantages over an electrical amplifier in that it has low noise and superior linearity, and that it is possible to maintain the linearity even if the number of optical levels is increased. Such advantages are not available with an electrical-amplifier. In addition, reflection and distortion occur when impedance becomes uncontrollable because the electrical-amplifier is connected through a resistor. However, in the case of the optical amplifier, less reflection or no distortion occurs because optical fiber is used.

USP 5,793,511 (Bulow), USP 6,240,055 (Takamine) and Applicants' admitted prior art corresponding to Figure 5 of the present application disclose that an optical signal to be measured modulated by a pulse signal is <u>electrically</u> branched in order to generate the reference pulse signal and measuring pulse signal. The electrical branch point in each of the cited patents is identified in the attachment to this response (see the A in Fig. 3 of USP 5,793,511 and the B in Fig. 1 of USP 6,240,055 attached hereto).

The cited references and the present claimed invention are similar in that the autocorrelation bit error of the optical signal to be measured is detected in accordance with the comparison result between the reference pulse signal and the measuring pulse signal. However, the cited references and the present claimed invention differ in that, *inter alia*, in the cited references the optical signal to be measured which is modulated by a pulse signal is electrically branched, whereas in the present claimed invention the optical signal to be measured modulated by a pulse signal is optically branched by the optical branch means. There is no disclosure, teaching or suggestion in the cited references to employ optical branch means as recited in claim 1.

That is, the present claimed invention as defined by claim 1 is patentable over the cited references because the references do not disclose, teach or suggest, *inter alia*:

> optical branch means for branching an optical signal to be measured modulated by a pulse signal and outputting branched optical signals as first and second optical pulse signals (see claim 1, lines 5-8).

In view of the foregoing, claim 1 and claims 2-4 which are either directly or indirectly dependent on claim 1 are patentable over the cited references under 35 USC 102 as well as 35 USC 103.

Claim 5 is a method claim which corresponds to claim 1. Claim 5 is patentable over the cited references for reasons, *inter alia*, set forth above in connection with claim 1.

Claim 6 is dependent on claim 5 and is patentable over the cited references in view of its dependence on claim 5 and because the references do not disclose, teach or suggest each of the limitations set forth in claim 6.

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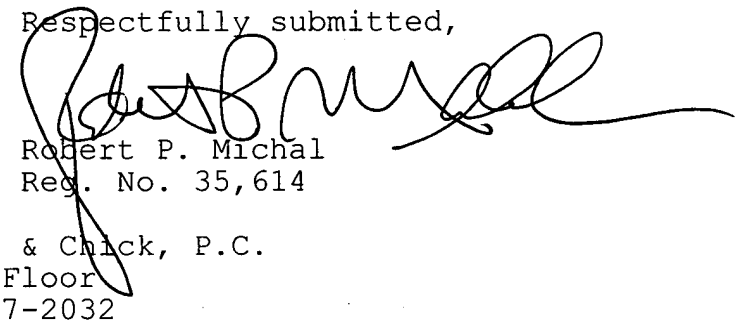
Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner disagrees with any of the foregoing, the Examiner is respectfully requested to point out where there is support for a contrary view.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,



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Encl.: Copy of Figs. 3 and 4 of USP 5,793,511
Copy of Fig. 1 of USP 6,240,055